Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D. C. 20554

In the Matter of	)	
	)	
Amendment of Parts 22, 90 and 94	)	**WT Docket No. 95-70**
of the Commission's Rules to Permit	)	**RM-8200**
to Permit Routine Use of Signal Boosters)		

To: The Commission

COMMENTS
OF
CELWAVE, A DIVISION OF RADIO FREQUENCY SYSTEMS, INC.

Celwave, a division of Radio Frequency Systems, Inc. ("Celwave") , by counsel and pursuant to Section 1.415 of the Commission's rules and regulations, 47 C.F.R. § 1.415, respectfully submits in response to the Commission's Notice of Proposed Rule Making ("NPRM").[1]

I. BACKGROUND

Celwave designs and manufactures antenna systems and components for world-wide land mobile applications. Celwave is headquartered in Marlboro, New Jersey. For over sixty years the company has been a supplier of communications equipment and sells its communications equipment to radio manufacturers, wireless system operators and distributors worldwide. Celwave's present product line includes signal boosters, amplifiers, dividers, base

[1] 60 FR 33782 (June 29, 1995). An extension of the time to submit Comments was granted by Order of the Chief, Private Wireless Division. 60 FR 36772 (July 18, 1995).

station and mobile antennas, transmission line, mobile and base station filters, multi-couplers and combiners.

Celwave is a leading manufacturer of signal boosters and currently holds type acceptance authorizations from the Commission for various unidirectional and bi-directional units.

II. COMMENTS

Celwave encourages the Commission to adopt the NPRM with minimal changes. Radio system operators with "holes" in their coverage areas find it difficult to compete in the marketplace because of the user's requirement for "perfect" service.

Further, many two-way mobile systems are vital to protection of the public safety and welfare, such as fire, police and rescue radio systems. The ability of an officer to be in constant contact with the dispatcher is critical in life-threatening situations. These systems require extremely high reliability throughout the coverage area.

Celwave agrees with the Commission in paragraph 7 that requiring the use of directional antennas is unnecessary. While it is almost always desireable to use a directional antenna, there is no need for the Commission to require its use.

The Commission in paragraph 10 discusses the use of translators. Celwave agrees with the Commission's view of translators. Translators are intended primarily for extending coverage area, and Celwave is not aware of any advantage within a coverage area which translators offer over a Class A or Class B signal booster.

Celwave agrees with the Commission's logic in the NPRM that power for the system should be similar to portables in the field to limit interference and provide a balanced system. However, many of the portables in the 800 MHz band utilize 5 watts ERP. For this reason and the views expressed below, Celwave suggests that the Commission amend its proposed maximum power rule to specify that the "total output power" for both Class A and B boosters be specified as "effective radiated power", with a maximum ERP of 5 watts per channel.

ERP is a consistent way of specifying power limits in the rules. As the Commission is well aware, a total output power rule yields a large variety of effective radiated powers. For example, a 500 mW booster with a 16 dB gain antenna would result in a 20 watt ERP system. Yet, other system designs could suffer. For example, a prison installation with long stretches of cable to an omni-directional antenna would suffer signal degradation because the maximum power limit of the equipment would preclude the delivery of sufficient power to the antenna system. Since the concern is to minimize interference, it makes sense to express the maximum power in terms which most greatly impact potential interference, ERP.

The use of ERP will yield the production of better equipment and more cost effective system designs. Specifying the maximum power as ERP provides the system installer with more system flexibility and does not limit the creativity of equipment designers to provide the best product at the lowest cost.

Out-of-band emissions will not increase with the increased power. The most stringent specification of the out-of-band emission is the lessor of 43 + 10 $\log_{10}$ (Power Out) or 60 dBc. This formula calculates to -13 dBm for all power levels up to 50 watts.

It is Celwave's view that Class B boosters should have the same 5 watt ERP per channel maximum as proposed by Celwave for Class A boosters. As long as the equipment incorporates output limiting circuitry to maintain inter-modulation levels as specified in the Commission's Rules, it is Celwave's experience that interference concerns are overstated. Class A and B boosters must meet the same out-of-band emission requirements. Therefore, maximum ERP can be similarly regulated.

The primary concern with Class B boosters is the amplification of other channels. It is the desire of system designers to limit amplification of undesired channels because such unintended amplification robs available power from the intended channel. Therefore, system designers have a built-in incentive to limit adjacent channel amplification.

Often, some amplification of adjacent channels is not a concern. Many installations (such as hospitals, prisons, government offices and corporate office buildings) are closed environments with only one service provider's portables in use. Thus, the presence of some other low power channels being amplified is not a concern. Many tunnel systems use a base station feed point which controls the channels. In this situation, some system

designers would seek to utilize a lower cost Class B booster because of greater channel flexibility.

A potential concern is the increase in the noise floor created by broadband repeaters. A broadband repeater will increase the noise floor in its pass band along with radio signals. This increase is a function of the gain of the booster, not the output power level. The noise floor can be expressed as follows:

kTB= -174 dBm + 10 log (bandwidth of receiver) + NF + Gain

NF is the noise figure of the booster, and is typically less than 10 dB. The gain is a major contributor to the noise floor. It should be noted this effect is the same with base station equipment. The net effect per unit is minimal but potentially a problem if several boosters are installed in a given area.

This phenomena is not new to radio communications. As RF communications demands increase and new equipment is installed, noise and interference become a fact of life. If low cost, low power signal boosters are not used, more expensive, higher power and obtrusive base stations will be deployed that will increase interference.

The noise floor is another argument for allowing higher power for signal boosters. As mentioned previously, the higher power limit does not increase out-of-band emissions or noise interference. However, the higher power limit does reduce the number of signal boosters needed in any given application. Thus, fewer boosters mean less accumulative out-of-band emissions and noise.

It is Celwave's contention that type accepted signal boosters with a 5 watt ERP per channel limit and output limiting circuity (a concept which Celwave supports) are the most cost effective way of providing needed coverage with minimal impact on the RF environment and the public at large.

Celwave believes that the use of signal boosters need not be reflected on the licensee's station authorization as long as the signal boosters have been type accepted. Signal boosters do not increase the coverage provided by the licensee's authorized area of operation. The boosters merely provide the licensee the ability to penetrate structures within the operational area. Thus, the burden on the Commission to process applications to license signal boosters as part of a system far outweighs any benefit to the public received by such licensing.

III. CONCLUSION

WHEREFORE, Celwave, a division of Radio Frequency Systems, Inc., respectfully requests the Federal Communications Commission act in accordance with the views expressed herein.

Respectfully submitted,

CELWAVE, a division of
RADIO FREQUENCY SYSTEMS, INC.

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